

## THE QUALITY OF MEDIATIONAL TEACHING PRACTICED BY TEACHERS IN SPECIAL EDUCATION. AN OBSERVATIONAL STUDY IN NORWEGIAN PRIMARY SCHOOLS

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*In this case study the quality of mediational teaching was evaluated for interactions between teachers and pupils in special education in regular Norwegian primary schools. Mediational teaching is interpreted as a process by which a teacher mediates a given curriculum using certain categories in interactions with a pupil. The categories are focusing; affecting; expanding; competence; regulation; and different. The study is based on a social cognitive theory as developed by the Israeli scientist Reuven Feuerstein. Initially an observation instrument was developed. The instrument was used to measure the quality of mediational teaching practiced in four cases of teacher and pupil dyads. The results imply that the quality of mediational teaching was low in all four cases. These results may hopefully encourage teachers to employ a wider and more varied use of the categories in mediational teaching than what was found in this study.*

The objective of the present study is to investigate the quality of teaching as practiced by Norwegian primary school teachers towards pupils with special needs. The Israeli scientist Reuven Feuerstein describes how high mediational quality can stimulate cognitive development. According to Feuerstein the theory is cross-cultural and cross contextual (Feuerstein & Rand, 1997; Feuerstein & Feuerstein, 1991; Feuerstein, et al., 1980; Feuerstein, et al., 1979). The theory has been used by researchers to study mediational quality in mother- child interactions (Klein, 2001; Chiswanda, 1997; Klein & Alony, 1993; Klein, Weider, & Greenspan, 1987) and cross-age peer interactions (Shamir & Tzuriel, 2006, 2004, 2002). The theory has in little extent been used to study mediational quality in interactions between teachers and pupils. The purpose of this study was to develop and to test an observation instrument designed to measure the quality of mediational teaching as practised by teachers in special education in regular Norwegian primary schools.

### *Main concepts in Feuersteins theory*

Two main concepts in Feuerstein's theory are structural *cognitive modifiability* and *mediated learning experience* (Feuerstein & Rand, 1997; Feuerstein & Feuerstein, 1991; Feuerstein, et al., 1980; Feuerstein, et al., 1979). Modifiability is defined as a structural modification in the cognitive functioning of the individual departing from the expected developmental course (Kozulin, 2002). According to the theory, the individual can acquire learning and experience in two ways. One is through direct exposure to stimuli. The second way is by mediated learning experience. Mediated learning experience is the process of learning which occurs when another person serves as a mediator between the child and the environment, for example parents, teachers and more competent peers. The person prepares and reinterprets the stimuli from the environment so that they become meaningful and relevant for the child. Mediation is an active process. The mediator acts upon the stimulus by selecting, focusing, framing, providing meaning and locating the stimulus in time and space (Klein, 2001). The process of mediation affects cognitive structures and the child becomes modified. Then the child can acquire behaviour patterns and learning sets, which in turn become components of his capacity to gain further development through direct exposure to stimuli. Thus, mediated learning experiences may affect the propensity for learning from new experiences (Klein, 2001; Feuerstein, et al., 1980).

### *Research measuring mediational quality*

Pnina Klein has based several studies on Feuerstein's theory (Klein, 2001, 1992, 1988; Klein & Alony, 1993; Klein, Weider, & Greenspan, 1987). Klein identifies five categories as the universal characteristics of an interaction between an adult and a child, and these in turn convert the interaction into a mediated learning experience for the child. These categories are: *focusing, affecting, expanding, competence and regulation*.

In Klein's studies the quality of mediated learning experience in mother-infant-dyads are measured. For this purpose the observational instrument OMI (Observing Mediation Interaction) is used. OMI consists of empirical definitions of the five categories, and scoring keys for each category. OMI involves analysing videotapes and registering each maternal utterance or behaviour that matches a specific scoring key, and a category in sequences of interaction. The criterion for evaluating the quality of mediated learning experience within the sequences consists of counting the registered scores. The higher number of scores under each category, the higher the mediational quality is considered (Klein, 2001; Klein & Alony, 1993). In one study it was found that the quality of mediated learning experience predicted cognitive outcome measures up to four years better than children's own cognitive test scores in infancy, or other presage variables related to pregnancy, birth histories and to the mother's education (Klein, Weider, & Greenspan, 1987).

In several studies, Shamir and Tzuriel have investigated the effects of the training programme Peer Mediation with Young children (PYMC) on mediators' and learners' mediational quality as well as various domains of cognitive and school achievement (2006, 2004, 2002). The programme is based on the theoretical approaches of Vygotsky (1978) and Feuerstein (1979, 1980). The samples in these studies were composed of one group of children (mediators) and another group of younger children (learners). Each mediator was coupled with a learner. The mediators were assigned into either experimental or control groups. The experimental mediators received the programme. The control children received a general preparation for peer assisted learning. Following the interventions, all of the children participated in a peer-mediation activity which was videotaped and analysed by an adjusted version of the OMI. The results showed that the children in the experimental group received significantly higher scores than the control group on all five categories. Thus the performance of the experimental group indicated a higher mediational quality (Shamir & Tzuriel, 2006, 2004). The analytic instrument OMI was an important inspiration in the developing process of the observation instrument that was used in this study.

#### *Research problem*

The study seeks to answer the following question: *What characterises the quality of mediational teaching practiced by teachers in interactions with pupils in special education?* Firstly, an observation instrument was developed. Then this instrument was used to measure the teaching quality practised by teachers.

Since the study had a main focus on teacher's utterances in teaching situations the term mediational teaching was used to describe the interactions that occur between teachers and pupils. Mediational teaching is interpreted as a process where a teacher in an interaction with a pupil mediates curriculum to the pupil through the use of certain categories. In line with Feuerstein's theory, a good quality of mediational teaching will lead to cognitive development in pupils.

The term quality is a normative concept and describes how properties in a phenomenon correspond to certain criteria (Nilsen, 2003; OECD, 1989). At the same time quality is relative. It is difficult to express what characterizes high and low quality in general (Sayed, 1997). The meaning of the concept in a concrete study therefore needs to be clarified. Here the quality of mediational teaching is related to six categories. Later it will be described how these are defined.

#### **Method**

##### *The sample*

The research project comprises a case study (Yin, 2003). A case is defined as *a teacher-pupil-dyad that participates regularly in special education*. The term dyad specifies that only two people are present during the interactions (Bronfenbrenner, 1979), a teacher and a pupil.

All of the teachers in the sample were providing special education for pupils in regular primary schools. Pupils entitled to special education are pupils having some sort of learning difficulties that can lead to insufficient learning in regular teaching. In Norway it is the Educational-psychological counselling service in each community that decides whether a pupil is entitled to special education (Norwegian Act of Education of 1998). Thus it was common to the pupils in the sample that they had some kind of learning difficulties. Their difficulties were however of a rather moderate character. All the pupils belonged to a regular class. They received special education between four to ten lessons per

week. For the rest of the lessons they participated in regular teaching within their classes. Their age varied between nine and twelve, third to sixth grade.

The study involved six cases. The researcher contacted educational-psychological counsellors and headmasters in a large community in Norway. The cases were recruited by these persons.

Videotapes of special educational lessons were collected from the cases. The curricula that were taught during the lessons alternated between math, Norwegian, and religion. Only sequences of interactions within the videotapes in which the teachers tried to mediate the curriculum to the pupils were analysed. Sequences of social talk and individual working were excluded.

#### *Instrument development*

The observation instrument OMI included the categories, *focusing*, *affecting*, *expanding*, *competence* and *regulation* (Klein, 2001; Klein & Alony, 1993). In this study the definitions of these were translated to accommodate a school context (see below). The categories constituted frames that guided the development of the scoring keys in the analytic instrument.

To develop the instrument, approximately 60 minutes of videotapes were collected from two cases. The tapes were divided into sequences of interactions based on teaching activities. Sequences containing teacher mediation of the curriculum were selected and later transcribed (Kvale, 2007). The scoring keys were formulated by using the categories and the transcribed interactions as sources.

The developing process was executed in several steps. Firstly, interactions containing teacher utterances that could be used to formulate a scoring key for a category were identified. The next step involved formulating a term that adequately matched the chosen teacher utterances. This term was the label for the scoring key. The third step was to substantiate the way in which the selected teacher utterances and a label belonged to a certain category. The fourth step consisted of working out descriptions for the scoring keys.

The observation instrument used to measure the quality of mediational teaching consisting of the following categories and scoring keys:

First, *Focusing* contains the teacher's behaviour that focuses on directing the pupil's attention towards the curriculum. The following scoring keys were developed for this criterion, these include:

- 1) *Curriculum presentation* is an utterance presenting the curriculum that the pupil should work on in the situation. It does not include information that elaborates concepts.
- 2) *Activity request* consists of an utterance requesting the pupil to carry out one or more activities. It does not contain information that elaborates how the activity should be performed.
- 3) *Question asking* is an utterance demanding an immediate verbal response. It does not contain any information that elaborates concepts or in other ways reveals what kind of response that is wanted.
- 4) *Repetition of teacher utterance* involves an expression where the teacher repeats her own statement after one or more pupils have responded. It does not have to be a word for word repetition.
- 5) *Repetition of pupil utterance* consists of an utterance repeating the pupil's statement. The same words can be used or it can be a reformulation.
- 6) *Minimal responses* is a minor verbal utterance following a pupil's statement, e.g. yes, no, mm.
- 7) *Direction giving* identifies teacher behaviour combining verbal utterance and nonverbal behaviour, and describing where the pupil should focus his attention, e.g. books, texts, table etc. and
- 8) *Nonverbal behaviour* involves the teacher's body movements directed towards leading attention while no utterance is expressed.

Second, *Affecting* consisted of the teacher's utterances which express appreciation or affect in relation to the curriculum. The scoring keys developed for this criterion include:

- 1) *Evaluation of pupil experience* is an utterance commenting on the pupil's experience when working on a certain curriculum. The pupil has to be mentioned in the expression and in addition the comment has to be interpreted as an evaluation of the pupil's experience.
- 2) *Evaluation in relation to curriculum* points towards an utterance expressing emotions or affect when describing the curriculum. The utterance must contain expressions of affect that can be related to the curriculum. Examples of words of affect can be *exciting*; *difficult*; *interesting*, etc.

Then, *Expanding* identified the teacher's utterances directed towards the broadening of the pupil's cognitive awareness in relation to the curriculum. This criterion consists of the following scoring keys:

- 1) *Concept defining* is an utterance containing an accurate definition of one or more concepts.
- 2) *Concept expansion* consists of an utterance containing information that can be viewed as expanding a concept or a theme.

Next, *Competence* described the teacher's expressions of satisfaction with the pupil's behaviour in relation to work with the curriculum. For this criterion the following scoring keys were developed:

- 1) *Performance praise* contains an utterance positively valuing the pupil's performance. The expression must be related to a performance in the situation.
- 2) *Pupil praise* is an utterance positively describing the pupil as a person. The expression must be related to the pupil's performance in the situation.
- 3) *Praise with explanation* involves an utterance positively valuing the performance or describing the pupil as a person, and in addition elaborating why the praise is given.

Additionally, *Regulating* consisted of the teacher's expressions that could help the pupil to regulate behaviour according to task demands. The scoring keys for this category include:

- 1) *Performance description* is an utterance containing information that elaborates how the pupil should work with a certain task or curriculum. It must be obvious that the utterance gives the pupil information that can be useful in his work.
- 2) *Partly correct response introduction* contains an utterance partly introducing the correct answer or response in connection with a task or a question. The information should assist the pupil in giving a correct response.

Finally, *Different* involved teacher's expressions that did not fit the other criteria, but can still be viewed as mediational teaching. The criterion is scored when the teacher's utterance results in a pupil's response, and when that utterance does not fit under any of the other criteria. Examples of such utterances are neutral confirmations, utterances of endorsement and critique of the pupils work (Nyborg, 2008).

#### *Use of the observation instrument*

The instrument was used to measure the quality of mediational teaching as practiced in four cases. In this process two lessons of special education, lasting 30-45 minutes, were videotaped from each case. The tapes were divided into sequences of interactions based on activities. Four sequences containing mediation of curriculum were selected from each case, each lasting exactly five minutes.

The interactions were transcribed. Thereafter the instrument was used to score the teacher's utterances in the sequences. The instrument consists of six categories and seventeen scoring keys. Each scoring key was given a code. The application of the instrument involved using the scoring keys and the codes.

During the analyses, the transcriptions and video recordings of the interaction sequences were studied. When the teacher made use of one of the teaching strategies that was compatible with a scoring key in an utterance, the specific code identifying the scoring key was registered. In order for a score to be acknowledged, the pupil response had to be registered subsequently to the teacher's utterance. This enhanced the likelihood of the pupil having comprehended the teacher's utterance. The pupil's response could be verbal or non-verbal. Finally, the scores were counted.

The reliability coefficient of the mediational teaching scores was studied on a subsample of four sequences, 25 % of the data material (Gall, Gall, & Borg, 2007; Robson, 2002). The reliability coefficient reflects the extent of agreement between two independent observers scoring the six categories in mediational teaching within the sample of sequences. The co-observer was allowed to use the videotapes and the transcripts of the tapes. It was found that the inter-rater reliability coefficient based on Contingents-coefficient, C, was  $C=.87$  and that  $p < .001$ . This indicates a high degree of inter-rater reliability.

The purpose of using the observation instrument was to measure the quality of mediational teaching in each case. A criterion for evaluating the quality was therefore needed. As presented earlier the criterion used for evaluating mediational quality in the observation instrument OMI was related to the number of registered scores in each category (Klein, 2001; Klein & Alony, 1993). The higher the number of scores, the higher the quality was assessed to be. In this study it was decided to develop the criterion

used in the OMI further. This is because in some of the interactions the teacher and the pupil spoke rapidly and in others slowly. When they spoke rapidly more scores were registered than when they spoke slowly. Also, slow speech could be valuable for the pupils, and therefore slow speech does not necessarily mean that the quality is low. Conversely, rapid speech does not necessarily mean that the quality is high. The process of developing a procedure and a criterion to analyse the quality of mediational teaching as practiced in each case was an important stage of the study. How this was carried out will be described in the result section.

### Results

An analysis of the teaching quality in each of the four single sequences in each case was carried out first. Analyses were then executed on a cross sequence level. Finally the overall quality of mediational teaching was determined for each case.

#### *Single sequence analyses*

The criterion used to evaluate the teaching quality in each of the single sequences was the distribution of scores across the categories in view of the teaching content that was taught and the child's responses. If the teacher seemed to adjust the use of the categories to those contextual factors the teaching quality was evaluated as being good. The analysis of sequence number one in case one will serve as an example of how these analyses was carried out. The first table one was made of how the scorings in the sequence were distributed across the categories.

**Table 1**  
**Number of scorings and percentage of total sum sequence in interaction sequence 4, case 1.**

Criteria	Sequence 4	
	Number	%
1. Focusing	19	45
2. Affecting	0	0
3. Expanding	23	55
4. Competence	0	0
5. Regulating	0	0
6. Different	0	0
Total sum sequence	42	100

There were 42 scorings registered in the sequence. Focusing obtained 45 %, and expanding 55 % of these. The other categories *affecting*; *competence*; *regulating*; and *different* did not receive any scorings. In this sequence the teacher tried to mediate knowledge about Islam to the pupil. The teacher read from a book, explained concepts and asked questions. The pupil mostly responded by asking and answering questions. In view of this teaching content it seems appropriate that most of the teacher utterances were expanding. Such utterances could contribute to an expanding of the pupils understanding of the curriculum. In addition it was reasonable that the teacher used a lot of focusing because such utterances can contribute towards directing the pupil's attention towards the curriculum the teacher tried to mediate. Thus the quality of mediational teaching was evaluated as being good in the sequence.

#### *Cross sequence analyses*

The criterion used to evaluate the quality of mediational teaching here was related to how all the registered scorings in the four sequences in each case were distributed across the sequences. A wide distribution of the categories was evaluated as good teaching quality, and a narrow distribution as low quality. The teaching content varied across the four sequences in each case. Therefore there existed variations in the contextual conditions. A consequence of these variations is that the cross sequence analyses were not affected by one single sequence alone, but were influenced by four different teaching situations. It was therefore reasonable to expect variations in the teacher's use of the categories across the sequences. Variations in uses of the categories are positive because they all contain elements that

can stimulate the individual's cognitive development in different ways (Feuerstein, et al., 1980; Feuerstein, et al., 1979).

The results from the analyses of one of the cases can illustrate how teaching quality was evaluated across the sequences. Case one consisted of a teacher and a pupil in the fifth grade. The pupil was of non-native-speaking origin. He was generally delayed in development. He had four lessons per week with special education. The subject taught in the first and the third sequence was mathematics and religion in the second and the fourth sequence. Table two gives an overview over how all the scored teacher utterances in the case were distributed across the categories.

**Table 2**  
**Number of scorings and percentage of total sum sequence in interaction sequences 1-4, case 1.**

Criteria	Sequences									
	Sequence 1		Sequence 2		Sequence 3		Sequence 4		Totalsum criteria	
	N	%	N	%	N	%	N	%	N	%
1. Focusing	57	78	11	30	33	73	19	45	120	61
2. Affecting	0	0	0	0	0	0	0	0	0	0
3. Expanding	13	18	22	59	3	7	23	55	61	31
4. Competence	2	3	0	0	5	11	0	0	7	4
5. Regulating	0	0	4	11	2	4	0	0	6	3
6. Different	1	1	0	0	2	4	0	0	3	1
Total sum sequence	73	100	37	100	45	100	42	100	197	100

In sum, 197 scores were registered. Focusing obtained an average percentage of up to 61 %. Expanding also achieved a large percentage, 31 %. This means that the teacher used the other categories to a small degree. Competence only received 4 %, regulation 3 %, different 1 %, and affecting 0 %.

The profile that characterized the teacher's teaching across the sequences was that focusing and expanding were clearly dominating. This means that the pupil was frequently exposed to utterances directed towards leading his attention towards the curriculum. In addition the pupil often got access to information that contributed to elaborating his cognitive awareness in connection with the curriculum. The domination of these two categories did lead to lesser use of the other categories. Therefore, the pupil was exposed to other important aspects of mediational teaching to a limited extent. The pupil rarely got to hear that the teacher was satisfied with the pupil's answers or behaviour (competence). Neither did he get to hear the teacher express enthusiasm when speaking of the curriculum (affecting). In view of the teacher's narrow use of the categories, the quality of mediational teaching was evaluated as being low.

#### *Case analyses*

In order to answer the research question in the study it was necessary to determine the overall quality of mediational teaching as practiced by the teachers in each case. In most of the single sequences the teaching quality was evaluated as being good. The cross sequence analyses obtained a different result, however. Here the teaching quality was evaluated as being low in all of the cases. The difference between these results constituted a dilemma. Hence it was decided to consider only the cross sequence analyses when the quality of mediational teaching was to be evaluated in each case. The reason for this priority is that the single sequence analyses involved inferences about contextual factors' influence on teaching quality. This study can be seen as a part of the cognitive sciences. In cognitive science it is common to try to factor out the context to the maximum possible extent when conducting research. That is because research that includes context is seen as too vague and relativistic in its interpretations of results (Gardner, 1985).

The table shows how the sums of the scorings in the four sequences were distributed across the categories in all the cases. Table three elaborates the quality of mediational teaching as practiced in each case.

**Table 3**  
**Number of scorings and percentage of total sum sequence, case 1-4.**

Criteria	Case									
	Case 1		Case 2		Case 3		Case 4		Total sum case	
	N	%	N	%	N	%	N	%	N	%
1. Focusing	120	61	158	65	131	61	76	44	485	59
2. Affecting	0	0	0	0	14	7	2	1	16	2
3. Expanding	61	31	15	6	28	13	15	9	119	14
4. Competence	7	4	32	13	12	6	17	10	68	8
5. Regulating	6	3	21	9	18	8	46	26	91	11
6. Different	3	1	16	7	11	5	18	10	48	6
Total sum sequences	197	100	242	100	214	100	174	100	827	100

In all of the four cases focusing was the dominating category. When *focusing* is added to the second most used category, those two obtained 70 % in sum or more of the scores. In case one, the two criteria *focusing* and *affecting* together received 92 % of the scores. In case two *focusing* and *competence* achieved 78 %. In case three *focusing* and *expanding* gained 74 % of the scores, and finally in case four *focusing* and *regulation* received 70 %. The consequence was that the other categories obtained rather few scores in the cases. Therefore the quality of mediational teaching was evaluated as low in all the four cases.

#### *Cross case analyses*

Table three also visualises what collectively characterized the teacher's use of the categories. Eight hundred and twenty seven scorings were registered altogether in the four cases. Out of these *focusing* received 59 %, *expanding* 14 % and *regulation* 11 %. *Competence* gained 8 %, *different* 6 % and *affecting* 2 %. The percentage distributions across the cases can be used as a base for some reflections. *Focusing*, *expanding* and *regulation* were the most dominating categories. Together they obtained 84% of the scorings. These three categories can be interpreted to share some mutual properties. They all seem to share an immediate importance for the teachers when it comes to mediating a certain curriculum to a pupil. For the pupil to perceive the curriculum, he has to have his attention directed towards it. For the pupil to learn new aspects in connection to curriculum, the teacher must bring forward elements that expand the pupil's understanding of it. For the pupil to master tasks and working with curriculum, it is essential that the teacher gives the pupil information about how to perform the tasks. Thus it is understandable that the teachers gave those categories priority in the interactions.

This did however lead to lesser use of the other categories. *Different* was one of these. It describes teacher utterances that do not fit any of the other categories, but can still be interpreted as mediational teaching. The table shows that six percent of the utterances were registered here. Because these are rather few, and they do not stand out as a homogeneous group, it is chosen not to reflect any further about their presence in the data material.

*Competence* and *affecting* also received few scorings. These two can be interpreted to share some mutual properties. They both seem less essential for the teacher to use when mediating a given curriculum to a pupil. Expressions of satisfaction with the pupil's behaviour may seem unnecessary for the teacher to articulate when mediating curriculum to a pupil. The same can be said about affection. Expressions of emotions in connection to curriculum do not seem to be necessary for the pupil to grasp the curriculum. Thus it was natural that the teachers used these two categories to a lesser extent in their interactions.

Pnina Klein (2001) does not undertake any ranking of the categories. She argues that they all contain essential elements that can help children to gain cognitive development. Thus *competence* and *affecting* are, also significant. It is not hard to imagine that a teacher's expression of satisfaction with a pupil's

behaviour promotes the pupil's experience of mastery, and that a teacher's expression of enthusiasm will influence a pupil's motivation. Since the teachers seldom used these categories, the pupils were not exposed to them to any extent. Thus it seems that teachers should try to make more use of *competence* and *affecting* in interactions with pupils than was the case in this study.

### *Conclusion*

In the study the quality of mediational teaching practiced by teachers in interactions with pupils in special education were evaluated. The sample consisted of six cases of teacher- and pupil dyads. First an observation instrument was developed. In this process videotapes from two cases were used. The instrument consists of six categories and 17 scoring keys.

The instrument was applied to measure the teaching quality practiced in four cases. The evaluations were based on analyses of four sequences of interactions in each case. The conclusion made from the research question was that *the quality of mediational teaching was low in all the four cases*.

### **Discussion**

#### *Validity*

Several factors can be introduced to discuss the validity of the conclusion in the study (Shadish, Cook & Campbell, 2002; Nyborg, 2008). One aspect involves the criterion used to measure the overall quality of mediational teaching in each case. In the process of developing the criterion, the sequences of interactions in each case were analysed in two ways. First, each of the single sequences was analysed. The criterion used to determine the teaching quality in each sequence was whether the teacher seemed to adjust the use of categories to accommodate the curriculum that was taught, and the pupil's responses. It was found that the quality of mediational teaching was good in most of the single sequences. Subsequently, analyses on a cross sequence level were carried out. The criterion used here was only the spread of the distribution of the categories across four sequences of interactions. A wide distribution was judged as good teaching quality, and a narrow distribution as low teaching quality. Based on this criterion, it was found that the quality of mediational teaching was low in all of the cases. A decision was made to rely only on the cross sequences analyse when determining the overall quality of mediational teaching in each case. Thus the single sequence analyses were not used.

To exclude the single sequence analyses when deciding the quality of mediational teaching in each case might be subject to criticism. When the teaching quality in the single sequences was found to be mostly good, this can be argued to contradict the results of the cross sequence analyses. This can, however, be interpreted otherwise. In line with the theoretical framework of the study and of cognitive science, evaluations carried out without considering contextual components are viewed as more precise and unambiguous than evaluations including contextual elements. The results of the single sequences analyses are thus of less value. One might therefore question why the single sequence analyses were performed. One answer here is that the single sequence analyses was a necessary step when developing the criterion to evaluate the overall teaching quality in each case. The single sequence analyses also illustrate that evaluations of teaching quality are complex and challenging even when based on a strictly delineated phenomenon.

Aspects of external validity can also be discussed in relation to the study's conclusion. In case studies, external validity refers to establishing the domain to which a study's findings can be generalized (Yin, 2003). The study was not based on random sampling (Gall, Gall, & Borg, 2007). Therefore, considering generalisation implies reasoning and not statistic generalisation. Such a process can be characterized as analytic generalisation (Yin, 2003). For the conclusion to be valid the four sequences of interaction analysed across each case should also represent other sequences where the teachers mediated curriculum. This means that the sample of sequences can be judged as representing other sequences for each case that were not investigated. Two arguments support such a generalisation. There were variations in the curriculum taught in the four selected sequences in each case. Thus it can be claimed that the sequences represented a variety of contextual conditions. This can prevent the teacher's use of a specific curriculum from affecting the distribution of the categories. The other argument is mainly relevant for case one, two and three. For these cases there was little variation in the use of the categories between the four sequences. This means that the distribution of the categories was rather similar in these cases (Nyborg, 2008). The stability in the use of the categories across four sequences of interaction with different teaching content supports the assumption that the teachers would have exercised analogous teaching in other sequences. Based on these arguments it is claimed that the study's conclusion is valid.



*Relevance of theory*

A central element in Feuerstein's theory is the hypothesis that good quality of mediated learning experience, or mediational teaching performed by one person in an interaction with another person, promotes cognitive development for that person (Feuerstein, et al., 1980; Feuerstein, et al., 1979). This hypothesis can be considered as the rationale for using the theory as a theoretical foundation for educational research. The hypothesis has been tested empirically in studies focusing on interactions between mothers and young children. In cooperation with other researchers, Klein has found that a mother's quality of mediated learning experience with her own child can affect the child's cognitive development (Klein, 2001; Klein & Alony, 1993; Klein, Wieder & Greenspan, 1987). Thus the relevance of using Feuerstein's theory as a base for research is supported in this context.

Few studies seem to support the idea that a teacher's good quality of mediational teaching with a pupil has an impact on the pupil's cognitive development. It can therefore be argued that special educational research should try to examine if the hypothesis can be supported in this context. Children are influenced by many persons (Tzuriel, 2001). A teacher is just one of many persons affecting pupil's world. Thus we can not control how other teachers, parents, or peers influence the pupil's cognitive development. It can therefore be a real challenge to carry out studies attempting to disclose whether good quality of mediational teaching executed by one teacher has an influence on a pupil's cognitive development. This is perhaps one reason why so few such studies exist.

A consequence of the lack of research may be that an important precondition for applying Feuerstein's theory as a foundation for research is missing. An argument against this critique is that the process of teaching and interactions between teachers and pupils are very complex research objects. It can therefore be rational to base studies on theories in an educational context even though the empirical evidence supporting the theories' relevance is limited. Otherwise, research on teaching and interactions would be rather narrow. At the same time it is important to be aware and open about a theory's limitations.

*Applicability*

In any case study it is natural to discuss a study's applicability. One approach to this discussion is to look into how the results of the studies are relevant for possible consumers of the results (Gall, Gall, & Borg, 2007). The most likely consumers of the results in this study are teachers. Even though we do not know for certain that a teacher's good quality of mediational teaching necessarily leads to cognitive development for the child exposed to the mediation, the results can be applicable for teachers. There are a number of aspects that a teacher can rely on when planning or performing teaching (Pressley et al., 2006). Examples can be the pupil's skills and qualifications, the pupil's motivation, curriculum, teaching methods and materials, classroom management, communicational strategies, etc. What the teacher chooses to prioritize will depend on contextual conditions in any teaching situation. Thus the applicability of the results does not necessarily depend on whether the hypothesis in Feuerstein's theory in general is likely to be correct or not in a special educational teaching context. The most important issue is whether the individual teacher believes that Feuerstein's theory and the categories in mediational teaching are relevant when planning or performing teaching. If teachers find the categories relevant, the study's results can be seen as applicable.

So how can the results be applicable for teachers? One aspect involves the observation instrument. When developing the instrument, both theory and data were used. The theories' contribution was the definitions of the categories in mediational teaching. The data comprised video observations from two cases. This means that the generated scoring keys can be seen as a connecting link between theory and practice. Thus the scoring keys can illustrate how the categories can be adapted by teachers in their teaching.

Due to the narrow distribution of the teacher's use of categories, the quality of mediational teaching was evaluated as low in all the four cases. Knowledge about the distributions of the categories in each case might be relevant for teachers. However, the most interesting results were perhaps the distribution of the categories that existed across all of the 16 sequences of interaction in the four cases. It was found that the teachers mostly used the categories *focusing* followed by *expanding* and *regulation*. Together those three obtained as much as 84 % of the teacher's utterances. This means that the other three categories, *different*, *competence* and *affecting* were used to a little extent. The pupils seldom heard the teachers expressing satisfaction with the pupils' behaviour in relation to work with the curriculum. The

teacher's expressions of enthusiasm or other emotions in connection to the curriculum were even less frequent. It is likely that pupils receiving special education are in the need of teachers using utterance of *competence* and *affecting* more frequently. Hopefully these results can inspire teachers to employ a wider and more varied use of the categories in mediational teaching than what was found in this study.

#### *Implications for further studies*

Feuerstein's theory has to little extent been used to study mediational quality in interactions between teachers and pupils. A new instrument designed to measure the quality of mediational teaching practiced by teachers in special education was therefore developed in this study. The instrument and the research project can probably inspire other researchers who want to study teaching quality based on Feuerstein's theory.

The sample in this study was rather limited. Thus we do not know if the results are valid for other teachers practicing special education. It could therefore be interesting to perform a follow up study in order to obtain a wider picture of the quality of mediational teaching as practiced by teachers.

Research based on Feuerstein's theory focuses mainly on interactions between two persons (Shamir & Tzuriel, 2006, 2004, 2002; Chiswanda, 1997; Klein, 2001; Klein & Alony, 1993; Klein, Wieder, & Greenspan, 1987). A similar focus was chosen in this research project, since interactions between a teacher and a pupil were studied. A lot of the special education in Norwegian schools is however organized as teaching in small groups, where one teacher is teaching two or more pupils. A relevant continuation of this research project might be to study the quality of mediational teaching practiced by teachers towards groups of pupils.

The research has been conducted in a Norwegian context. According to research overviews composed in recent years in Norway, few studies seem to exist that have focused on teacher- pupil interactions in special education (Solli, 2005; Bachman & Haug, 2006; Opdal, Simonsen, & Hagtvet, 2005). Hopefully this study can stimulate further research focusing on teacher- pupil interactions in special education.

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